

Application No. 09/715,935

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and silicon tetrachloride ( $\text{SiCl}_4$ ) and, for aerosol delivery, a mixture of tetra(N-butoxy) silane and aluminum isopropoxide ( $\text{Al}(\text{OCH}(\text{CH}_3)_2)_3$ ). Similarly, suitable precursors for the production of aluminum titanate include, for aerosol delivery, a mixture of aluminum nitrate ( $\text{Al}(\text{NO}_3)_3$ ) and titanium dioxide ( $\text{TiO}_2$ ) powder dissolved in sulfuric acid or a mixture of aluminum isopropoxide and titanium isopropoxide ( $\text{Ti}(\text{OCH}(\text{CH}_3)_2)_4$ ).

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#### REMARKS

Claims 18-61 are pending. The specification was amended to update references to applications that have not issued. No new matter is introduced.

All of the pending claims stand rejected. Applicants respectfully request reconsideration of the rejections based on the following comments.

#### Rejections Over Akedo et al. and Bi et al.

The Examiner rejected claims 18-29 and 33-42 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 6,280,802 to Akedo et al. (the Akedo patent) in view of U.S. Patent 5,958,348 to Bi et al. (the Bi patent). This rejection seems to also include claims 44, 46, 47-51, 55-57 and 59-61, although these claims were not recited at the initial summary of the rejection. In response to Applicants' previous arguments over this combination of references, the Examiner asserts that the example in the Akedo patent relating to Figs. 6, 8 and 9 requires a particle stream input without specifying its form. The Examiner further argues that there would be a reasonable expectation of success of achieving a coating on a substrate using the product stream of the Bi patent for the inlet of the Akedo patent. The Examiner has made factual errors with respect to the disclosure in the Akedo patent and has not provided reasonable support for other assertions. Thus, the Examiner has failed to establish prima facie obviousness over the combination of the Akedo patent and the Bi patent. Applicants respectfully request

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reconsideration of the rejection over the Akedo patent in view of the Bi patent based on the following comments.

First, with respect to the motivation to combine the references, the Examiner asserts that the embodiments in Figs. 6, 8 and 9 of the Akedo patent do not require the use of an aerosolizing chamber. This is incorrect with respect to the teachings in the Akedo patent. At column 6, lines 12-16, the Akedo patent describes Figs. 1-8 as relating to the deposition of "aerosolized ultrafine powders." At column 8, lines 30-36, the Akedo patent explains that the aerosolizing chamber of Fig. 5 provides input for the coating chambers of Figs. 6, 8 and 9. Furthermore, the particle stream described in the Bi patent is NOT suitable as the flow 23 in Figs. 6, 8 and 9 of the Akedo patent. The Akedo patent describes flow 23 as including ultrafine particles AND ionized gas. See, column 9, lines 15-25 and column 10, lines 6-17 and 25-34. Because of the differences in the difference in the nature of the flows, the particle flow disclosed in the Bi apparatus cannot be substituted for the flow 23 in Figs. 6, 8 and 9 of the Akedo patent. The embodiment in Fig. 9 can alternatively be used along with the aerosol chamber of Fig. 7. However, the Bi apparatus is similarly not a substitute for the aerosol chamber of Fig. 7. Therefore, the Examiner was incorrect in asserting that the particle flow described in the Bi patent is an appropriate substitute for the aerosol particle flow described in the Akedo patent with respect to Figs. 6, 8 and 9.

Applicants' maintain that the natural combination of the teachings of the Akedo patent and the Bi patent is the production and collection of particles using the Bi apparatus and introducing the particles collected into the aerosol chambers of the Akedo patent. The combination suggested by the Examiner is clearly based on hindsight based on Applicants' disclosure itself.

Applicants further maintain that there is no reasonable expectation of success since the Akedo patent is based on particular ways of accelerating particles for the coating

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process. As can be seen from the above discussion directed to Figs. 6, 8 and 9, the Examiner has not presented a prima facie analysis to establish a reasonable expectation of success based on the explicit descriptions in the cited references due to the significantly different technologies disclosed respectively in the Akedo patent and the Bi patent. The Examiners' assertions that the apparatuses in the Akedo patent only require a flow of nanoparticles is simply not correct since the flow of particles described in the Bi patent does not fulfill the Akedo patent's requirements for the flow as described above explicitly for Figs. 6, 8 and 9 of the Akedo patent.

Since there is no motivation to combine the references, since the combination suggested by the Examiner is based on hindsight in view of Applicants' disclosure and since there is no reasonable expectation of success of Applicants' claimed invention based on the teachings of the references, the Examiner has not established prima facie obviousness over the combined teachings of the Akedo patent and the Bi patent. Applicants respectfully request withdrawal of the rejection of claims 18-29 and 33-42 under 35 U.S.C. § 103(a) as being unpatentable over the Akedo patent in view of the Bi patent.

Rejections Over Lehman, Akedo et al., Bi et al. and Kambe et al.

The Examiner rejected claims 30, 43, 45, 52 and 58 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 6,097,144 to Lehman (the Lehman patent), in view of the Akedo patent and the Bi patent in further view of PCT application WO 99/23189 to Kambe et al. (the Kambe application). In the response to Applicants' arguments, the Examiner indicated that "Lehman, the primary reference, teaches the need for producing a uniform glass coating." However, the Lehman patent does not make up for the significant deficiencies of the combination of the Akedo patent and the Bi patent with respect to the claimed coating process. Therefore, the combined disclosures of the Lehman patent, the Akedo patent, the Bi patent and the Kambe application do not render Applicants' claimed invention prima facie obvious.

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Applicants respectfully request reconsideration of the rejection based on the following comments.

These claims depend ultimately from either claim 18, 33, 39 or 56. As noted above, there is no motivation to combine the disclosures of the Akedo patent and the Bi patent to arrive at the methods of independent claims 18, 33, 39 or 56, absent improper hindsight based on Applicants' own disclosure. Also, the combined teachings of the Akedo patent and the Bi patent do not provide a reasonable expectation of success with respect to the claimed processes. The Lehman patent and the Kambe application do not supply the motivation to combine the disclosures, and the Lehman patent and the Kambe application similarly do not provide a reasonable expectation of success. Therefore, there is no need to consider the issues raised regarding silica precursors and glass formation. For the reasons discussed, the combined disclosures of the Lehman patent, the Akedo patent, the Bi patent and the Kambe application do not renders Applicants' claims prima facie obvious.

Applicants respectfully request withdrawal of the rejection of claims 30, 43, 45, 52 and 58 under 35 U.S.C. § 103(a) as being unpatentable over the Lehman patent, in view of the Akedo patent and the Bi patent in further view of the Kambe application.

Rejections Over Tran et al., Lehman, Akedo et al., Bi et al. and Kambe et al.

The Examiner rejected claims 31 and 32 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 6,074,888 to Tran et al. (the Tran patent) in view of the Lehman patent, and further in view of the Akedo patent and the Bi patent in view of the Kambe application. The Examiner cited the Tran patent for disclosing methods for making optical components. The combination of the teachings of the references, however does not lead to Applicants' claimed invention and, thus, does not render the claims prima facie obvious. Since the deficiencies of the references go to the broad aspects of the invention, Applicants do not need to address presently the specific issues regarding photolithography, optical device formation and

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the like. Applicants respectfully request reconsideration of the rejection based on the following comments.

Claims 31 and 32 depend ultimately from claim 18. As discussed above, the combined teachings of the Lehman patent, the Akedo patent, the Bi patent and the Kambe patent do not render claim 18 obvious. The Tran patent is directed to the formation of optical components using semiconductor fabrication techniques. The Tran patent discusses the use of conventional epitaxial techniques for the deposition of single-crystal semiconductors. See, for example, column 3, lines 24-27. The Tran patent does not teach techniques for deposition relevant to the present claims or to the approaches described in the other cited references. Thus, the Tran patent does not make up for the deficiencies of the Lehman patent, the Akedo patent, the Bi patent or the Kambe application. Therefore, the combined teachings of the cited references do not render claims 31 and 32 prima facie obvious.

Applicants respectfully request withdrawal of the rejection of claims 31 and 32 under 35 U.S.C. § 103(a) as being unpatentable over the Tran patent in view of the Lehman patent, and further in view of the Akedo patent and the Bi patent in view of the Kambe application.

Rejections Over Börner et al. and Bi et al.

The Examiner rejected claims 18-29, 39-41, 50 and 51 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 6,032,871 to Börner et al. (the Börner patent) in view of the Bi patent. The Examiner cited the Börner patent for disclosing spraying materials onto a substrate. The Examiner asserted that the Börner patent is silent with respect to the way in which the particle streams are produced. The Examiner further asserted that the Bi patent discloses an efficient way of generating a particle stream for use in the Börner process. However, the Examiner's characterization of the disclosure in the Börner patent is not accurate. Based on an appropriate reading of the Börner patent, the combined disclosures of the Börner patent and the

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Bi patent do not render Applicants' claims prima facie obvious. Applicants respectfully request reconsideration of the rejections based on the following comments.

The feature emphasized in the Börner patent is the use of two electrospray apparatuses to produce both positive and negative powder sprays. However, the Börner patent is NOT silent with respect to how these powder sprays are produced. It is clear that the Börner patent describes the use of conventional "electrostatic application devices which are referred to as applicators 1, 2." See column 2, lines 34-37. At column 1, line 64 to column 2, line 4, the Börner patent indicates that "A powder spraying apparatus that is suitable for implementing the process is described, for example, in the German published non-prosecuted patent application DE 195 42 863 A1. Simultaneous or alternate spraying of positively and negatively charged powder can be achieved if, in accordance with a concomitant feature of the invention, at least one of the application devices is a corona spray gun and at least one of the application devices is a triboelectric spray gun." Thus, the Börner patent teaches the use of a corona spray gun and a triboelectric spray gun. It is well known that electrostatic spray guns use an aerosolizing chamber to form a powder aerosol that is fed to the electrostatic nozzle. See, for example, U.S. Patents, 4,747,546; 5,167,714; 5,718,767 and 5,831,855. The Börner patent must be read in the context of the electrospray art to which it is directed. Since the Börner patent makes use of an electrospray apparatus with an aerosolizing chamber to introduce particles, the Börner patent has all of the shortcomings of the Akedo patent with respect to combination with the Bi patent.

Since the Börner patent is based on technology using an aerosolizing chamber to create a powder flow, there is no motivation to combine the Börner patent with the Bi patent to arrive at Applicants' claimed invention. Similarly, there is no reasonable expectation of success with respect to introducing the Bi apparatus as a source within the device of the Börner patent. Since the technologies of the Bi patent and the Börner patent are significantly different from each other, the Examiner is clearly using improper hindsight based on Applicants' own

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disclosure to assert obviousness of the claimed invention. For these reasons, the combined teachings of the Börner patent and the Bi patent do not render Applicants' claimed invention prima facie obvious.

Applicants respectfully request withdrawal of the rejection of claims 18-29, 39-41, 50 and 51 under 35 U.S.C. § 103(a) as being unpatentable over the Börner patent in view of the Bi patent.

Rejections Over Börner et al, Akedo et al. and Bi et al.

The Examiner rejected claims 53 and 54 under 35 U.S.C. § 103(a) as being unpatentable over the Börner patent in view of the Akedo patent and the Bi patent. The Examiner cites the Börner patent for disclosing the desire to have powder coatings of two different materials applied to the same substrate surface. The Examiner indicates that it would be obvious to have an "Akedo and Bi apparatus" provide each stream. However, due to the deficiencies of the cited references disclosed above, the combined teachings of the references do not render the claims prima facie obvious. Applicants respectfully request reconsideration of the rejections based on the following comments.

"It is impermissible, however, simply to engage in a hindsight reconstruction of the claimed invention, using the applicant's structure as a template and selecting elements from references to fill the gaps." In re Gorman, 18 USPQ2d 1885, 1888 (Fed.Cir. 1991). The Examiner has the burden of establishing a prima facie case of obviousness. In re Brouwer, 37 USPQ2d 1663 (Fed. Cir. 1996). The inquiry into obviousness is highly fact specific. Id.

First, as presented above, the combination of the Akedo patent and the Bi patent does not lead to a "Akedo and Bi apparatus" without the use of impermissible hindsight based on Applicants' own disclosure. Furthermore, both the devices from the Akedo patent and the laser pyrolysis apparatus from the Bi patent have significant differences from the electrostatic spray guns of the Börner patent. Thus, even if there was a "Akedo and Bi apparatus" (which there is

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not), there would be no motivation to substitute the "apparatus" into the device of the Börner. Specifically, it is not clear how particle streams from an "Akedo and Bi apparatus" would generate positive and/or negative particles by choice. Plus the plasma of the devices in the Akedo patent could interfere with the basic principles of operation of the devices in the Börner patent.

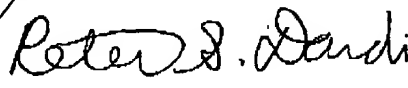
The Examiner is simple selecting elements that have very different characteristics to reconstruct Applicants' invention using Applicants' disclosure as a template. The operation of the devices in the Börner patent, the Akedo patent and the Bi patent operate on very different principles. To simply pick desired features to reconstruct the claimed invention is not reasonable without more guidance from the prior art on how to connect these disparate technologies, and this process is contrary to established legal precedent. The Examiner has failed to establish prima facie obviousness of Applicants' claimed invention. Applicants respectfully request withdrawal of the rejection of claims 53 and 54 under 35 U.S.C. § 103(a) as being unpatentable over the Börner patent in view of the Akedo patent and the Bi patent.

#### CONCLUSIONS

In view of the foregoing, it is submitted that this application is in condition for allowance. Favorable consideration and prompt allowance of the application are respectfully requested.

The Examiner is invited to telephone the undersigned if the Examiner believes it would be useful to advance prosecution.

Respectfully submitted,

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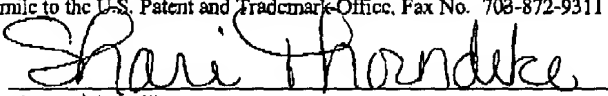
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## CERTIFICATE OF FACSIMILE TRANSMISSION

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June 19, 2002

Date

  
Shari R. Thorndike  
✓

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ATTACHMENT  
MARKED-UP AMENDMENTSpecification As Amended

At page 53, line 31 to page 54, line 10, the paragraph has been amended as follows:

For example, the production of silicon oxide nanoparticles is described in copending and commonly assigned U.S. Patent Application Serial Number 09/085,514 to Kumar et al., entitled "Silicon Oxide Particles," incorporated herein by reference. This patent application describes the production of amorphous  $\text{SiO}_2$ . The production of titanium oxide nanoparticles and crystalline silicon dioxide nanoparticles is described in copending and commonly assigned, U.S. Patent Application Serial Number 09/123,255, now U.S. Patent 6,387,531 to Bi et al., entitled "Metal (Silicon) Oxide/Carbon Composites," incorporated herein by reference. In particular, this application describes the production of anatase and rutile  $\text{TiO}_2$ .

At page 55, lines 1-14, the paragraph has been amended as follows:

The production of iron, iron oxide and iron carbide is described in a publication by Bi et al., entitled "Nanocrystalline  $\alpha\text{-Fe}$ ,  $\text{Fe}_3\text{C}$ , and  $\text{Fe}_7\text{C}_3$  produced by  $\text{CO}_2$  laser pyrolysis," J. Mater. Res. Vol. 8, No. 7 1666-1674 (July 1993), incorporated herein by reference. The production of nanoparticles of silver metal is described in copending and commonly assigned U.S. Patent Application Serial Number 09/311,506, now U.S. Patent 6,394,494 to Reitz et al., entitled "Metal Vanadium Oxide Particles," incorporated herein by reference. Nanoscale carbon particles produced by laser pyrolysis is described in a reference by Bi et al., entitled "Nanoscale carbon blacks

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produced by CO<sub>2</sub> laser pyrolysis," J. Mater. Res. Vol. 10, No. 11, 2875-2884 (Nov. 1995), incorporated herein by reference.

At page 55, line 31 to page 56, line 14, the paragraph has been amended as follows:

The production of ternary nanoparticles of aluminum silicate and aluminum titanate can be performed by laser pyrolysis following procedures similar to the production of silver vanadium oxide nanoparticles described in copending and commonly assigned U.S. Patent Application Serial Number 09/311,506, now U.S. Patent 6,394,494 to Reitz et al., entitled "Metal Vanadium Oxide Particles," incorporated herein by reference. Suitable precursors for the production of aluminum silicate include, for vapor delivery, a mixture of aluminum chloride (AlCl<sub>3</sub>) and silicon tetrachloride (SiCl<sub>4</sub>) and, for aerosol delivery, a mixture of tetra(N-butoxy) silane and aluminum isopropoxide (Al(OCH(CH<sub>3</sub>)<sub>2</sub>)<sub>3</sub>). Similarly, suitable precursors for the production of aluminum titanate include, for aerosol delivery, a mixture of aluminum nitrate (Al(NO<sub>3</sub>)<sub>3</sub>) and titanium dioxide (TiO<sub>2</sub>) powder dissolved in sulfuric acid or a mixture of aluminum isopropoxide and titanium isopropoxide (Ti(OCH(CH<sub>3</sub>)<sub>2</sub>)<sub>4</sub>).